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SO YOU WANT
TO LEARN MORE ABOUT

COMPUTERS IN EDUCATION

digital

EDUCATION COMPUTER SYSTEMS

INTRODUCTION: WHY BUY?

INTRODUCTION—WHY COMPUTERS IN EDUCATION?

Computing is fast becoming an integral part of modern education for both instructional and administrative functions. More and more schools and colleges are turning to the computer to handle a variety of administrative and academic applications.

Computer technology enables educators to streamline and modernize administration while providing students with a more rewarding and challenging learning experience. For about the same cost as conventional administrative data processing alone, Digital's dual-function educational computing systems—administration plus instruction—can also improve the scope and quality of education.

Administrative efficiency

Accurate and efficient, the computer can assist a school administrator in managing business operations professionally and productively. Computers can handle administrative functions such as fiscal accounting, payroll, budgeting, record-keeping, scheduling, registration, grading and attendance. Using computers, administrators can have immediate access to all school records so that they may continually monitor and evaluate all aspects of the institution's operation. Management information systems and financial simulation can aid administrators in allocating current resources and in planning realistically for the future.

Improved instruction

Because the computer permits students to actively participate in their own education process, it is able to provide and sustain a high level of student interest, involvement and motivation. Students can often learn a greater amount of material in less time and retain it longer.

In exploring a new concept with the computer, the student can experiment in any direction and at his own pace. He sets the challenge for himself, then rises to meet it—the perfect example of self-motivation. He learns by his own choices, experiences and decisions.

Individualization on a mass basis

The concept of individualized instruction is a significant development in modern education. New curricula are being tailored to the individual student's needs and skills level. Computers have the potential to meet the needs of individualized learning while meeting the economics of mass instruction. Computer-based instruction enables students to work independently; at the same time, it allows teachers to handle larger numbers of students.

By contributing to modern, innovative administration and creative, challenging instruction, computers have become a valuable tool for enriching the learning experience of students at all levels of education.

HOW TO BUY AN EDUCATIONAL COMPUTER SYSTEM

Selecting a vendor for an educational computer system is not a trivial process. Often it involves much constructive examination of the institution itself and its goals. Once the school's computing needs are well-defined over a reasonable time horizon, the following points should be carefully considered when evaluating the proposed solutions of different vendors.

Experience and commitment

Hardware and software, of course, are important considerations in selecting an educational computer system that will meet present demands and keep pace with future growth. But perhaps of greater value in selecting the best possible system—economically and technologically—is the vendor's experience in and commitment to the education market.

Digital, a price/performance leader in computers, has unmatched experience in the field of education. Since 1960, Digital has been a pioneer in educational computing systems. Digital developed the minicomputer and produced the first timesharing system with vendor-supported software; this innovation made the computer directly accessible at all levels of education. Today, Digital furnishes more computers for interactive student instruction than any other manufacturer. Over five thousand installations span the globe: in educational research and development centers, in university and college computer centers, and in urban and rural classrooms in many of the world's countries.

HOW TO BUY APPLICATIONS & PRODUCTS

simple combinations of English words, algebraic symbols, and decimal numbers. For more advanced or special-purpose computing, other languages are readily available.

Digital computers are engineered for the busy school environment,

and most can be installed and used in an ordinary classroom. With most systems for instructional use, no operator is necessary. Interacting with the computer is done through simple user commands, as shown in the following example:

HELLO

RSTS V06A-02 EPG/ECP RSTS/E JOB 7 KB0 15-MAR-76 15:57

#26,1

PASSWORD:

EPG/ECP RSTS V6 TIME SHARING

READY

DIR/BR

SLITS1.BAS SY:[26,1]

DROS .BAS

FREQ .BAS

CLOUDS.BAS

PHOTEL.BAS

ROOTS2.BAS

ARITH .BAS

READY

DIR POL??? .BAS/BR

POLSYS.BAS SY:[26,1]

POLUTE.BAS

POLICY.BAS

3 FILES 37 BLOCKS

READY

RUN POLUTE

WATER POLLUTION STUDY

INSTRUCTIONS (1=YES, 0=NO)? 1

User requests to "log on" by saying HELLO. The system identifies itself and prompts the user for his account number and password (for security, the password is not printed).

User requests a BRief DIRectory listing of programs stored in his account.

User requests a BRief DIRectory listing of all BASIC programs in his account whose names begin with POL.

User requests the system to fetch and RUN the desired program.

Multifunctionality

Many computer systems that handle administrative data processing have neither the flexibility nor the capacity for instructional timesharing. Other systems, geared to student timesharing, often lack the language or file-storage capability for administrative data processing. Digital believes that economy need not compromise flexibility of operation or the level of service for either function. Within a price range that fits the budgets of most schools and colleges, Digital offers computers that can simultaneously handle both instructional and administrative tasks. Many Digital users run such dual-function systems every day of the school year.

Capacity or throughput

A widely-held but mistaken assumption that instructional computing uses only a small portion of the computer's capacity often leads to the acquisition of a system that has insufficient "horsepower" to perform even instructional computing alone. For every two or three beginning users, each needing only 5% of the computer's available main memory, there is usually at least one advanced student or faculty member engaged in heavy computational work requiring, say, 30% of the available memory. With the addition of administrative data processing, high system throughput becomes still more critical.

Because of its long experience in timesharing, Digital's systems are designed to handle efficiently the portion of instructional computing

management, and processing in high-level languages such as COBOL and FORTRAN. Batch processing, available with most systems, allows the greatest number of students to interface with the computer and also provides an efficient means of administrative processing.

A system's capacity is also determined by its peripheral devices: disks, tapes, card readers, line printers; they must provide sufficient data file storage and fast pathways for data to move in and out of the system. Choosing from the widest variety of peripherals in the minicomputer industry, a Digital user may select those which best meet his processing needs. Digital systems ensure that all peripheral devices may be accessed by any authorized user.

Product breadth and expandability

As computing requirements increase, good systems should be able to grow in gradual, modular increments—another magnetic tape or disk unit to store more programs or data, additional memory to accommodate more users. It should not be necessary to scrap half the hardware the school has already bought, or rewrite all its applications software, to achieve what should be a gradual increase in capacity. Vendors should be required to detail the expandability of their system(s) throughout the capacity range the school will require over at least a 5-year period. This will prevent the all-too-common case where an attractive initial savings is more

INTRODUCTION: WHY BUY?

computer model within a thousand miles. Happily, educators tend to be associative people, and there are many benefits to be gained by association with an active group of users of similar computer systems.

To promote the interchange of programs and information among users, Digital supports an active users' group, DECUS (Digital Equipment Computer Users Society). DECUS holds meetings biannually in the United States and annually in Canada, Europe and Australia; publishes symposia proceedings and a general newsletter; and maintains a large user library of contributed programs. DECUS also sponsors EDUSIG, the Education Special Interest Group. Composed entirely of Digital users in education, EDUSIG participates in the DECUS meetings and publishes a periodical called EDUSIG NEWS.

Reliability

Unless it is up and running when needed, a computer system is virtually useless. It must have a low failure rate and must be easy to repair when failure occurs.

Digital has made reliability and serviceability watchwords of its engineering and manufacturing operations. Dependability is designed into every Digital computer system. Before leaving the manufacturing plant, every system undergoes countless quality control tests, from exhaustive

component testing to a comprehensive systems-level checkout.

Field support and training

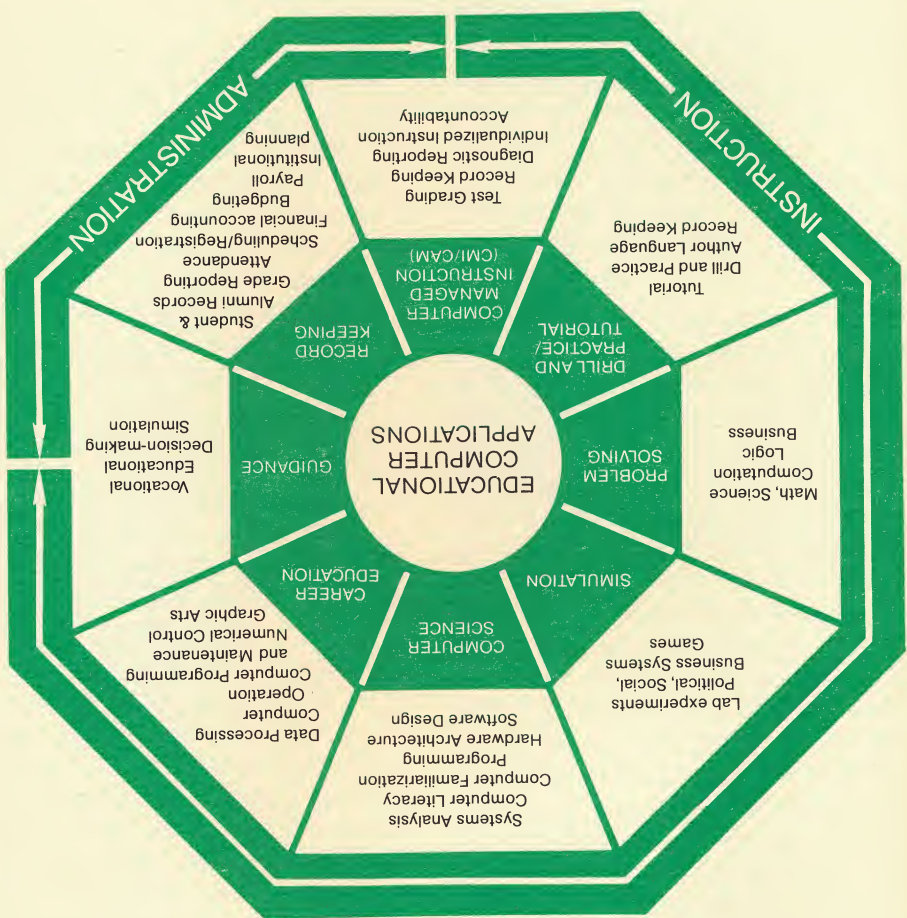
Since a computer system is a complex combination of electronics and programming, a school generally needs ready access to a variety of vendor support services. Most schools elect to have the vendor provide hardware maintenance under a prepaid contract.

Similarly, most installations can benefit from high-level software consulting services in the design of complex application packages.

All Digital systems are backed up by a full array of available hardware and software support services. On-site and formal classroom training is available with every Digital system. Additional support may include 90-day unconditional on-site hardware warranty, and on-site remedial or advisory assistance provided by software experts. Service and parts are backed up by an extensive worldwide network of branch, district and regional service centers.

APPLICATIONS OF EDUCATIONAL COMPUTERS

Educational computing applications range from arithmetic drill and practice in a third grade classroom to simulations of pathology laboratory techniques for medical students; from problem solving to vocational and career guidance; from processing all student, faculty and alumni records in a small college to general accounting and management of an entire statewide university system. Digital can offer complete software packages to handle most of the common educational applications, which are described in the following pages. For further information on Digital's applications software packages, just check the appropriate areas of interest on the reply card at the back of this booklet.



Applications Summary Chart

APPLICATIONS & PRODUCTS

ADMINISTRATION

Student, faculty and alumni record keeping

Handling administrative functions efficiently and cost-effectively, while maintaining high instructional standards, is a constant concern to school administrators at all levels of education.

Processing students' records is one of the most voluminous and time-consuming administrative tasks. Most colleges use the computer for registration and scheduling more than for any other single activity. Registration methods vary. In one method, students fill out course request cards that are later processed in a single batch by the computer. Another technique allows students to request courses in direct interaction with the computer via conveniently-located terminals. At the same time, their schedules are stored in the computer for inquiry and analysis by the registrar, cashier, and guidance personnel. The assignment procedure also supplies information for grade reporting and, when required, attendance recording. In addition to their current student body, many schools maintain records on applicants and graduates. Using one Digital application package, the computer simplifies this huge clerical job by transferring a student's record from one file to another as his status changes; data need be collected and entered into the system only once. All information is available for immediate and selective inquiry or updating by the responsible administrative offices. For example, the computer can print mailing lists for all alumni or selective lists according to particular years of graduation or geographical areas.

Accurate, current personnel records not only assist the school administrator, but can also contribute to a satisfied staff. Besides maintaining personal information, a computer system can record a teacher's credits toward in-step rate increases and accrued vacation and sick leave. A computerized payroll system can calculate wages, tax liabilities and other deductions for salaried and hourly personnel; print checks; and generate entries to the budget and general ledger reports.

Resource management

Accountability and cost/benefit analysis are important factors in allocating a school's resources. Through the use of a computer, program planning and budgeting techniques can be applied to the management and operation of a wide range of school resources. The administrator can have access to up-to-the-minute records on finances, facilities and policy planning.

General accounting and budget management are administrative areas where the computer is highly effective. Recording revenue sources and expenditures, a computer-based accounting system can write purchase orders, pay invoices and payrolls, reconcile checks, and periodically report the status of budget accounts. Also, the speed and large storage capacity of a computer allow the incorporation of analytical reports into a computer-based financial system. No longer must an administrator risk overexpending an account because of inaccurate or unavailable data.

A computer system can also help an administrator forecast school requirements so that he can plan more realistically for the future. The educator, using a simulation model tailored to his institution, enters estimated future parameters such as student body population, new academic departments, and teacher salary increases; and the computer provides information concerning the impact of various planning decisions on resources such as money, space and personnel. Digital's timesharing computers have long been found useful in the business world for applications related to inventory management, whether of railroad freight cars or automotive parts. There are several educational applications whose essence is almost pure inventory management: among them are the control of circulating library materials; control of audio/visual equipment and other learning resources; and helping to manage the college or university bookstore. In summary, Digital has all the tools you need to manage your resources efficiently—tools for flexible data entry, for generalized record and file management, and for inquiry, update, and report writer needs. And all are designed for ease of use with a minimum of programming required.

Computer managed instruction (CMI)

Computer managed instruction, sometimes called comprehensive achievement monitoring (CAM), manages and monitors student progress against a predetermined set of



John J. ...

instructional objectives. The student's progress is measured through frequent testing; the computer scores the tests, records the results, keeps comprehensive records on all students, and identifies exceptional students. By using CMI, teachers are relieved of the enormous administrative burden of grading tests and recording grades; the computer helps them to evaluate all of their students and to pinpoint all learning problems. Rather than wasting professional time on clerical chores, teachers can spend more time teaching and giving individual attention to all students.

Guidance and career counseling

Rapid access to accurate, current records is an asset to the entire school staff, but is especially useful in counseling students. Questionable attendance patterns and grade trends may be detected early so that remedial actions can be initiated.

Interactive guidance systems are available to introduce students to different vocations and careers, to aid high school students in their selection of colleges, and to help students deal with human relations and personal development problems. One available package actually teaches students about career decision-making as an instance of the general process of personal choice—along the way, helping the student to become more aware of his own values and how these influence personal choice.

INSTRUCTION

Problem solving

Problem solving is the most widely implemented instructional use of the computer today. It is valuable in all levels of mathematics and business studies, and in many portions of the science curriculum. Problem solving with the computer promotes abstract reasoning and accurate, logical thought; the computer becomes a laboratory for testing and using mathematical methods and

logical relationships. Instead of doing homework problems using a new concept, the student writes a program that uses the new concept. Before the computer does the actual calculations, the student must literally teach the machine to solve the problem. Many schools have found that this simple but exciting change leads to profoundly better learning;



virtually all students respond to the challenge of working with the computer.

Simulation and gaming

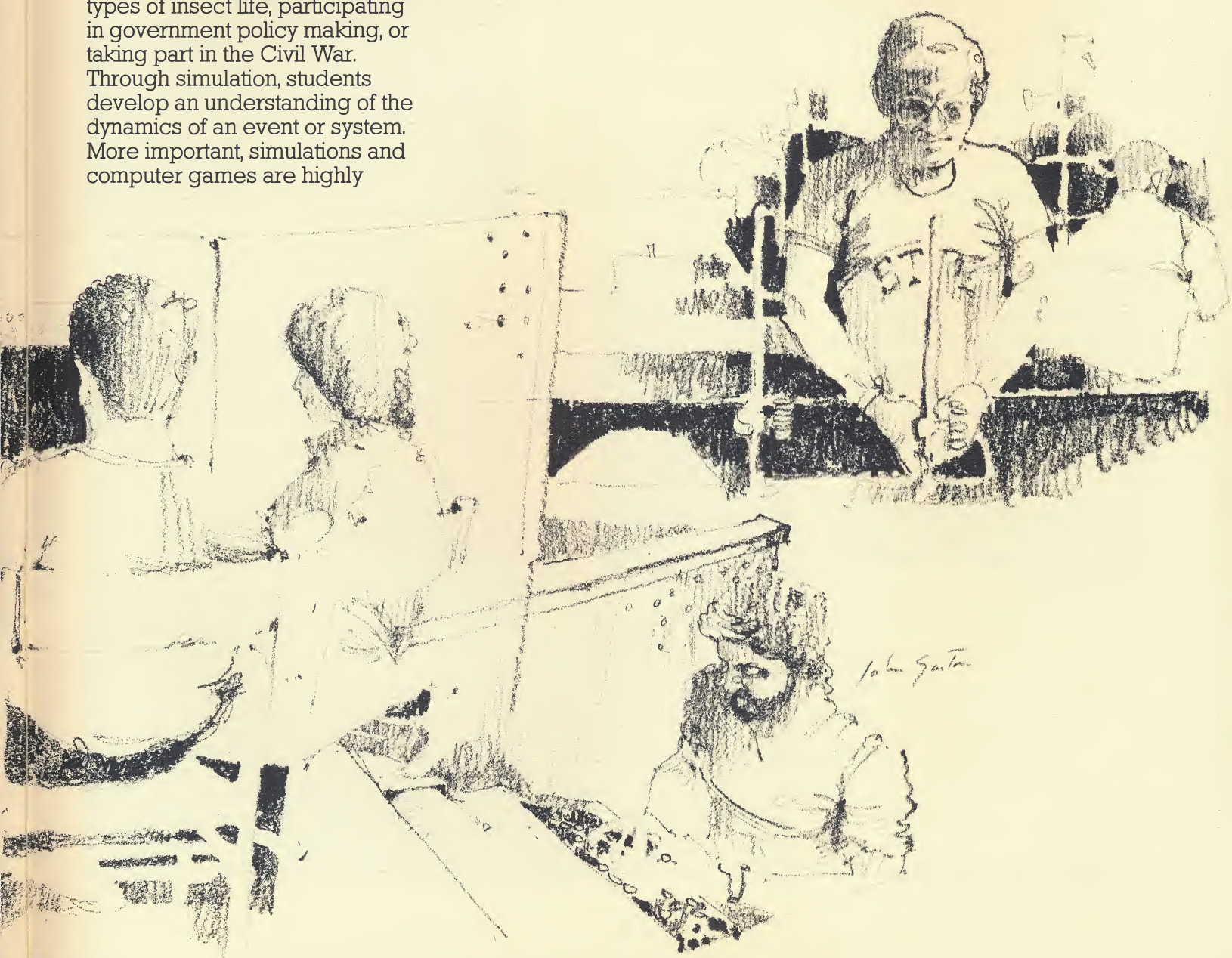
Simulations are programs in which a real event, natural phenomenon, or laboratory experiment is modeled using the computer. Computer simulation can turn the classroom into a laboratory for performing otherwise dangerous, costly or time-consuming experiments. Like a time machine, simulations can analyze in minutes events that may span generations in "real life." Students can experience events that they might ordinarily never be exposed to: landing a lunar module, studying the effects of pesticides on various types of insect life, participating in government policy making, or taking part in the Civil War. Through simulation, students develop an understanding of the dynamics of an event or system. More important, simulations and computer games are highly

motivational and foster learning through discovery.

Drill and practice/tutorial (CAI)

Computer-Assisted Instruction (CAI) offers a dynamic environment for programmed learning, drill and practice, and tutorials. As a drill-master, the computer is impartial and infinitely patient. Students can work in a self-paced mode, practicing skills and concepts they have learned in class. The computer gives every student individualized attention while freeing the

teacher from monotonous drill. Tutorial programs present factual information, and periodically check the student's understanding by presenting him with appropriate questions. Depending on his responses, he may be branched either to more advanced or to remedial material. Tutorials may furnish material in a straightforward manner, as a textbook or lecture would, or they may be problem-oriented to help students develop inquiry and problem-solving skills.

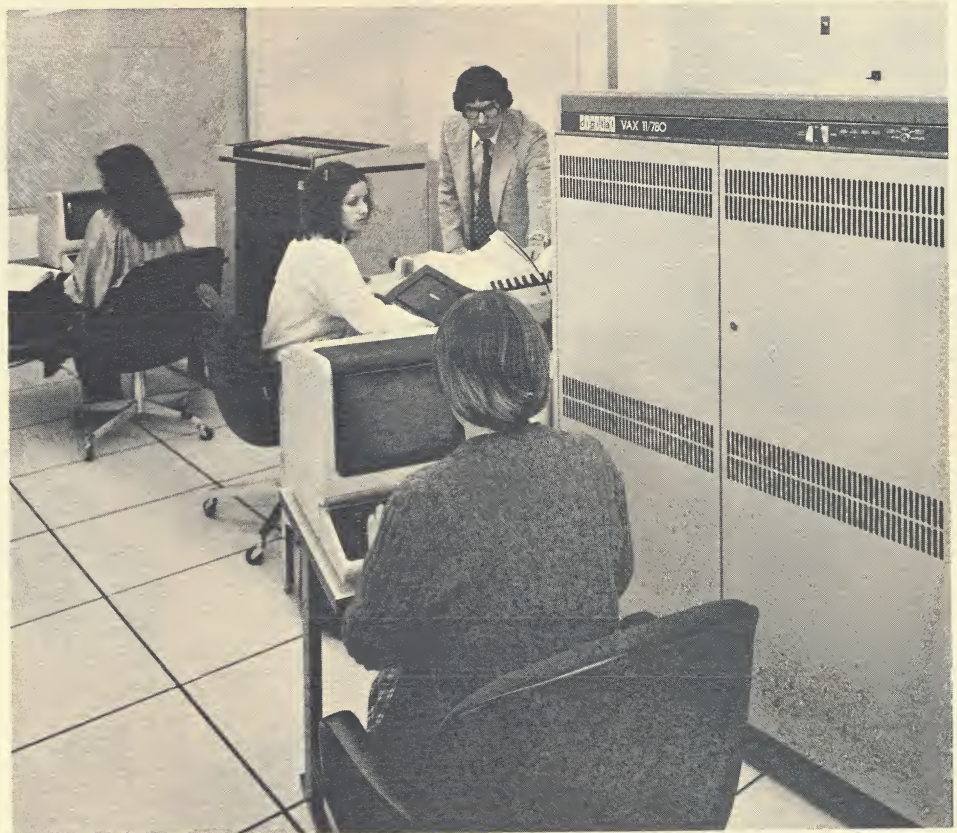


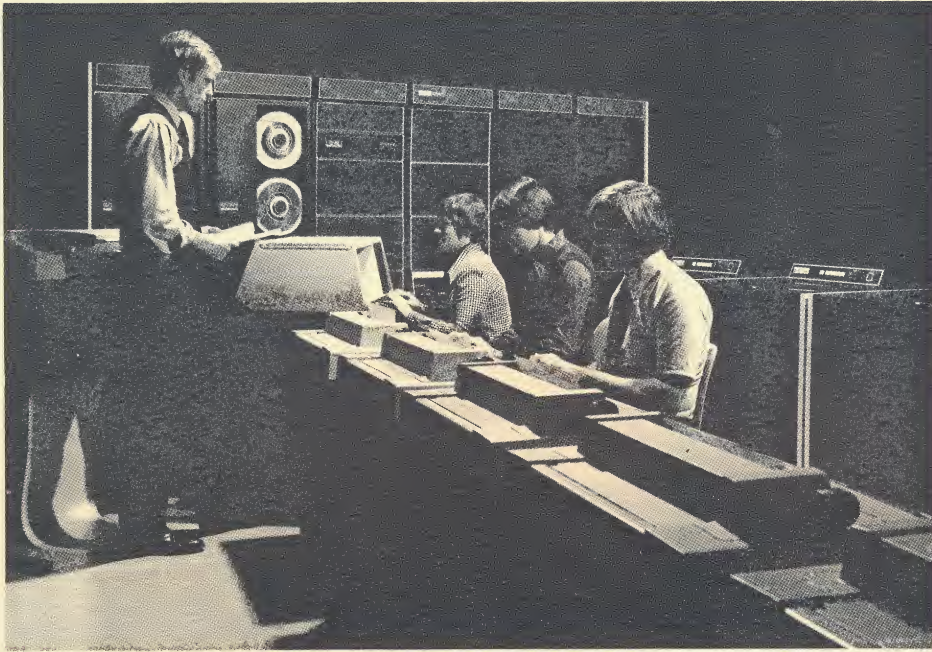
PRODUCT SUMMARY

The PDP-11/34 provides a convenient growth path for users who need to start small, but expect to end up fairly large. In its smallest configurations, the 11/34 runs the same software as the MU/11V03 for low-cost academic computing. As needs expand, the user can add the hardware required to run RSTS/E, opening the pathway to many more academic users or a dual-function administrative/academic system.



VAX-11/780 is a multiuser, multi-language, multiprogramming, high-performance computer system. The system combines a 32-bit architecture, a virtual memory operating system, and efficient memory management to provide essentially unlimited program space. The primary features of VAX are its fast FORTRAN computation power, large address space, virtual architecture, open design, and its growth from the PDP-11 family.





Large PDP-11/70 systems are helping many schools and colleges accomplish both administrative and academic computing. The popular RSTS/E operating system enables up to 63 users to access the system concurrently, giving each the illusion of sole possession of the computer's resources. Users may select from a variety of languages—BASIC-PLUS, FORTRAN IV, RPG II, APL, COBOL or assembly language—or they may simply interact with pre-written applications programs.



On a per-user basis, the MU/11V03 is simply the lowest cost multi-user BASIC system available at anywhere near its price range. The basic configuration is capable of supporting as many as four concurrent users—three working in BASIC and the fourth in either BASIC, FORTRAN IV, or assembly language. Designed with classrooms in mind, the MU/11V03 uses space-saving packaging. A graphics terminal with easy-to-use supporting software is available.



The DECSYSTEM-20 is a multi-purpose system that handles interactive timesharing and multi-programming batch tasks simultaneously—for up to 64 concurrent users. It features a 36-bit word length and 70-bit fixed and floating point double precision arithmetic. The DECSYSTEM-20 runs the TOPS-20 operating system and can support all the high level languages a school or college needs: BASIC, COBOL, FORTRAN, APL, ALGOL, and CPL.

Note: Features of these and other Digital systems are summarized in the chart on the following page.

SUMMARY CHART

	MSB-11	MU-BASIC/RT11 (MU/11V03)	MU-BASIC/RT11 (11/34)	RSTS/E	VAX/VMS	DECSYSTEM-20	DECsystem-10
Computer family (PDP-)	11	11	11	11	11/780	10	10
Max. # of simultaneous users	—	4	8	63	63	64	175
Languages available:							
Interactive BASIC	✓	✓	✓	✓		✓	✓
BASIC-PLUS II				✓	✓		
FORTRAN IV	✓	✓	✓	✓	✓	✓	✓
ASSEMBLER		✓	✓	✓	✓	✓	✓
COBOL				✓	✓	✓	✓
FORTRAN IV PLUS				✓	✓		
ALGOL						✓	✓
APL		✓	✓	✓		✓	✓
RPG II				✓	✓		
PASCAL					✓		
Appropriate applications:							
Instruction	✓	✓	✓	✓	✓	✓	✓
Administration		✓	✓	✓	✓	✓	✓
Processing modes:							
Timesharing (or interactive)		✓	✓	✓	✓	✓	✓
Batch	✓			✓	✓	✓	✓
Real-time					✓		✓
Network communications		✓	✓	✓	✓	✓	✓

After selecting the most appropriate system from this chart, your Digital salesperson can tailor it to meet your application requirements by choosing from one of the broadest ranges of processors, peripherals and terminals available in the computer industry.

Note: Typical price ranges for these systems generally increase from left to right across the chart. Various financial plans are available.

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- ☐ DECUS/EDUSIG (User Group)
- ☐ Other Digital users in education

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- ☐ Short-term: 3-12 months
- ☐ Long-term: for information only

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- ☐ Administrative data processing
- ☐ Computer-assisted instruction (CAI)

Please send me more information on:

- ☐ Large-scale timesharing systems (DECsystem-10 and -20)

- ☐ Please send me information on the EDU magazine.



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